REMARKS

Applicants appreciate the consideration shown by the Office as evidenced by the Office Action mailed on 06 November 2003. In that Office Action, the Examiner objected to claims 40 and 60 on informalities and rejected claims 1-71. In this Response, Applicants have amended claims 1, 3, 5, 8, 9, 26, 28, 30, 33, 34, 40, 45, 51, 52, and 60; and have cancelled claims 2, 7, 10-14, 24, 25, 27, 32, 36-39, 44, 46, 50, 53-55, and 62. Applicants respectfully request favorable reconsideration in light of the above amendments and the following remarks.

1. Claim Objections

Applicants have amended claims 40 and 60 to change the recitation of "said at least one metal" to "said metal" and respectfully emphasize that the recitation of "metal" in these two amended claims contemplates embodiments in which more than one metal is present in the protective layer.

2. Claim Rejections: 35 U.S.C § 112

Applicants respectfully submit that the amendment to claim 45, which incorporates the recitation of "a thermal barrier layer" into this claim, provides proper antecedent basis for the recitations of "said thermal barrier layer" in claims 47 and 48. Applicants respectfully submit that claims 47 and 48 are thus in compliance with 35 USC 112, second paragraph.

3. Claim Rejections: 35 U.S.C. § 102

A. Przybyszewski

Claims 1, 7, 11, 15-22, 26, 32, 36, 40-42, 45, 53, 54, 56-60, 63, and 68-70 were rejected under 35 U.S.C. 102(b) as being anticipated by Przybyszewski (US 4,851,300; hereinafter '300). Applicants respectfully traverse this rejection.

'300 fails to teach, suggest, or disclose all of the limitations recited by the present claims, and thus cannot anticipate the rejected claims at issue. '300 describes a platinum and platinum-rhodium coating on a superalloy substrate. A bond coat may be interposed

between the substrate and the platinum-containing layer. However, there is no mention in '300 of a thermal barrier layer. In stark contrast, amended independent claims 1, 26, and 45, and originally filed claim 63 all recite a thermal barrier layer. Applicants respectfully submit that '300 does not anticipate these independent claims and their respective dependent claims because this reference presents no teaching, suggestion, or disclosure of a thermal barrier layer. Applicants respectfully request favorable reconsideration of this rejection.

Applicants further dispute the Examiner's equating of the MCrAlY bond coat layer described in '300 with the diffusion barrier layer recited in the claims at issue. As the above issue regarding the lack of a thermal barrier layer is considered by Applicants to be dispositive of this rejection, and as the issue of equating bond coats with diffusion barriers by the Examiner appears in other rejections issued by the Examiner in the present Office Action, Applicants address this issue substantively in the discussion of other applied references, below.

B. Nagaraj et al.

Claims 1, 7, 9-11, 13-22, 26, 32, 34-36, 38-42, 45, 50, 51, and 53-60 were rejected under 35 U.S.C. 102(b) as being anticipated by Nagaraj et al. (US 5,484,263; hereinafter '263). Applicants respectfully traverse this rejection.

The independent claims affected by this rejection are claims 1, 26, and 45, each of which has been amended to recite a thermal barrier layer disposed over the protective layer. '263 does not teach, suggest, or disclose a thermal barrier layer disposed over a protective layer. Applicants thus respectfully submit that claims 1, 26, and 45, and their respective dependent claims, are patentably distinct from '263, and respectfully request favorable reconsideration from the Examiner.

C. Darolia

Claims 1-7, 11, 15-22, 26-32, 34-36, 38-42, 44-51, 53, 54, 56-60, and 62-71 were rejected under 35 U.S.C. 102(e) as being anticipated by Darolia (US 6,558,813; hereinafter '813). Applicants respectfully traverse this rejection.

In this and other rejections set forth in the present Office Action, the Examiner relies upon the presence of an aluminum-containing bond coat, such as an MCrAlY or nickel aluminide, to purportedly anticipate Applicants' recitation of a diffusion barrier layer. Applicants respectfully submit that the diffusion barrier used in embodiments of the present

invention and recited in the rejected claims cannot be fairly interpreted to be the equivalent of a bond coat as set forth in this and other applied references.

In describing the definition and function of the diffusion barrier layer, Applicants set forth the following:

> Diffusion barrier layer 25 significantly reduces migration of elements via solid state diffusion between substrate 20 and protective layer 30, thereby maintaining an effective concentration of oxidation-resistant elements within protective layer 30, while **restricting contamination of protective layer 30 with oxide-forming elements such as aluminum and chromium from substrate 20**. In addition, diffusion barrier layer 25 reduces the risk of the formation of intermetallic phases, which may be brittle and have undesirably low melting points, in substrate 20 or protective layer 30. (emphasis added)

Given such a description, those skilled in the art would not construe an aluminide or MCrAlY bond coat as a diffusion barrier within the meaning of that term as used in the present application, because it is well known that aluminum from such bond coats readily diffuses into adjacent coating layers and/or substrate materials. For example, in US Patent No. 6,306,524 to Spitsberg et al., applied by the Examiner in other rejections set forth in the current Office Action, diffusion barrier materials are described for the express purpose of restricting the diffusion of Al from the aluminum – rich bond coat (including the explicit examples of MCrAlY and aluminide bond coats) into the substrate. Col. 1, line 66 – Col. 2, line 57. No fair reading of the present application can construe an MCrAlY or aluminide bond coat with a diffusion barrier as recited in the present application, because an aluminide or MCrAlY layer would not function as the diffusion barrier is intended to function; rather than restricting contamination with aluminum, the coating would actually promote this undesirable result.

Independent claims 1, 26, 44, 45, 62, 63, and 71 were all rejected under this applied reference. Claims 44 and 62 have been cancelled. Claims 1, 26, and 45 each recite a diffusion barrier layer. As explained above, '813's description of a bond coat does not anticipate the recitation of a diffusion barrier layer because such bond coats are not barriers to aluminum solid state diffusion (and in fact act as sources of free aluminum to promote solid state diffusion). As '813 does not teach, suggest, or disclose a diffusion barrier layer within the scope of the present invention, Applicants respectfully submit that claims 1, 26,

and 45, and their respective dependent claims, are patentably distinct from the applied reference.

Independent claims 63 and 71 do not recite a diffusion barrier layer. However, these claims recite "a substrate comprising ... at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof." In '813, the substrate is a nickel-based superalloy and there is no teaching, suggestion, or disclosure that the substrate can or should comprise the composition recited in claims 63 and 71. Applicants therefore respectfully submit that claim 63, its dependent claims, and claim 71 are patentably distinct from '813.

D. Nagaraj et al.

Claims 1-3, 7, 11, 15-20, 26-28, 32, 36, 40, 45-48, 50, 51, 53-60, 63, 64, and 68-70 were rejected under 35 U.S.C. 102(e) as being anticipated by Nagaraj et a1 (US 6,627,323; hereinafter '323). Applicants respectfully traverse this rejection.

As in the previous rejection, the Examiner equates an aluminum-rich bond coat, in this case MCrAlX or aluminide coatings, with the diffusion barrier layer recited in several of the rejected claims. Applicants respectfully dispute this assertion for the reasons described above. As '323 fails to teach, suggest, or disclose a diffusion barrier layer, Applicants respectfully submit that claims 1, 26, and 45, along with their respective dependent claims, are patentably distinct from '323.

Moreover, '323 fails to teach, suggest, or disclose a thermal barrier layer as that term is used in the present application. The very thin, dense aluminum oxide outer coating described by '323 is actually a sacrificial reaction layer used to raise the melting point of CMAS material as it moves into the coating. In fact, because this coating is not a thermal barrier layer, '323 includes a layer of YSZ beneath the CMAS protection system to provide thermal protection to the substrate. No fair reading of '323 would construe the aluminum oxide coatings to be thermal barrier layers as that term is recited in the claims of the present invention.

Finally, independent claim 63 recites "a substrate comprising ... at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof." The substrate in '323 given to be a gas turbine component, typically made of a superalloy. The component substrate is protected by a multilayer coating system

of which a layer of noble metal is a part. However, there is no teaching, suggestion, or disclosure that the substrate can or should be a substrate comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof, and so Applicants respectfully submit that claim 63 and its dependent claims 64 and 68-70 are patentably distinct from '323.

E. Darolia

Claims 1-6,15-22,24-31,40-42,44-49,56-60, and 62-71 were rejected under 35 U.S.C. 102(e) as being anticipated by Darolia (US 6,630,250; hereinafter '250). Applicants respectfully traverse this rejection.

This reference makes no mention of diffusion barrier layers. However, as has been explained above, claims 1, 26, and 45 have been amended to recite a diffusion barrier layer, and so Applicants respectfully submit that these claims and their respective dependent claims are patentably distinct from '250.

Claims 63 and 71 recite "a substrate comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof." However, in '250 the substrate is preferably a nickel-based superalloy (col. 2, lines 4 et seq.) and merely a thin coating layer comprises the noble metal Ir. As no mention is made in '250 about a substrate having the composition recited in claims 63 and 71, Applicants respectfully submit that these claims and their respective dependent claims are patentably distinct from '250.

4. Claim Rejections: 35 U.S.C. § 103

A. Discussion of Spitsberg reference

The Examiner presented three separate rejections of certain claims under section 103, and in each of these three rejections one of the previously discussed references was combined with U.S. Patent No. 6,306,524 to Spitsberg et al. (hereinafter '524). This reference describes MCrAlY bond coats where Ru may be used to substitute for the Y. Additionally, this reference describes certain alloys of Ru that may be used to form diffusion barrier coatings. The Examiner relies upon these two descriptions to conclude that an MCrAlY coating that contains Ru additions would be considered a useful diffusion barrier as that term is recited by claims of the present invention. Applicants respectfully disagree.

Although '524 describes Ru alloys as attractive diffusion barriers, this description does not apply to alloys of the MCrAlY type, and so Applicants respectfully submit that the Examiner's conclusion is incorrect. '524 describes a coating system in which an MCrAlY bond coat protects a substrate. The MCrAlY bond coat may contain Ru. Despite the presence of the Ru in the bond coat, '524 describes that a diffusion barrier layer is needed to stop aluminum diffusion from the bond coat to the substrate. The diffusion barrier layer may be an alloy of Ru, but a much different type of alloy than an MCrAlY+Ru alloy. Those skilled in the art understand that the total amount of Y and/or Y substitutes (such as Ru) in a typical MCrAlY alloy is less than 1 atom percent. For example, Sulzer Metco's web site lists a number of NiCrAlY and CoNiCrAlY products for sale under the trade name AMDRY, none of which exceed 1% Y. See, for reference, http://www.sulzermetco.com/eprise/Sulzermetco/Sites/Products/ThermalSprayProducts/ThermalSprayMaterials/class.html?category=&subcat_id=4&subcategory=&class_id=19.

In stark contrast, the alloys referred to as diffusion barriers in '524 are described as containing at least about 10 atom percent Ru (col. 6, line 41) and indeed alloys are described having Ru contents of 80 atom percent and above. (Id., line 48). The diffusion barrier layers are further described as having a single-phase structure or, in some cases, a dual phase structure comprising a mixture of two solid solution alloys (Id., lines 44-64). MCrAlY coatings are more complicated alloys, often comprising a mixture of multiple phases, some of which are intermetallics or even oxides. Thus the MCrAlY coatings, while containing Ru, do not contain sufficient amounts of that element to be considered diffusion barriers, and further lack the microstructure described for the diffusion barrier layers. In fact, the reason for the use of the diffusion barriers in '524 is to stop diffusion of Al from the MCrAlY+Ru bond coat to the substrate, so '524 actually teaches away from the notion that a Ru-containing bond coat of MCrAlY type would be an effective Al barrier. Therefore, Applicants respectfully submit that '524 does not teach, suggest, or disclose the use of an MCrAlY bond coat (with or without Ru) as a diffusion barrier as that term is used in the claims of the present invention, and in fact teaches away from the use of such coatings as diffusion barriers.

B. '300 and '524

Claims 8-10,12-14,25,33-35,37-39, and 55 were rejected under 35 U.S.C. 103(a) as being unpatentable over Przybyszewski (US 4,851,300) in view of Spitsberg et al (US 6,306,524). Applicants respectfully traverse this rejection. The Examiner equates the MCrAlY bond coat used in '300 to a diffusion barrier, and applies '524 as a suggestion that this MCrAlY coating can contain Ru as a Y substitute, thereby giving a diffusion barrier comprising Ru. However, as Applicants have pointed out above, MCrAlY bond coats (even those comprising Ru) are poor diffusion barriers and in fact are viewed in the art as sources of, rather than barriers to, Al diffusion, and the Ru-containing barrier coatings described in '524 are completely different classes of materials from MCrAlY alloys. Moreover, of the rejected claims, only claims 8, 9, and 33-35 remain pending, and each of these depends from an independent claim that is not rejected under this applied combination of references and that is believed to be allowable for reasons described above. Applicants respectfully submit that claims 8, 9, 33-35 are allowable over the applied references because each depends from an allowable independent claim.

C. '813 and '524

Claims 8-14, 23-25, 33, 37, 43, 52, 55, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darolia (US 6,558,813) in view of Spitsberg et a1 (US 6,306,524). Applicants respectfully traverse this rejection. The pending claims at issue are claims 8, 9, 23, 33, 43, 52, and 61, of which claims 23, 43, and 61 are independent claims. Claims 8, 9, 33, and 52 depend from independent claims not rejected by the applied combination, and applicants submit that these claims are allowable because each depends from an allowable independent claim.

Each of the independent claims at issue recites a diffusion barrier comprising ruthenium (Ru). The Examiner equates the MCrAlY bond coat used in '813 to a diffusion barrier, and applies '524 as a suggestion that this MCrAlY coating can contain Ru as a Y substitute, thereby giving a diffusion barrier comprising Ru. However, as Applicants have pointed out above, MCrAlY bond coats (even those comprising Ru) are poor diffusion barriers and in fact are viewed in the art as sources of, rather than barriers to, Al diffusion, and the Ru-containing barrier coatings described in '524 are completely different classes of materials from MCrAlY alloys. Thus there is no teaching, suggestion, or disclosure that the

use of the MCrAlY bond coat in '813 with Ru substitution as described in '524 would result in a diffusion barrier comprising Ru, as recited in independent claims 23, 43, and 61. Applicants therefore respectfully submit that these claims are patentably distinct from the applied combination of references.

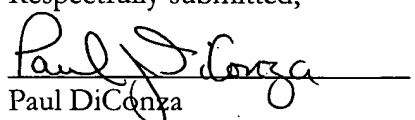
D. '323 and '524

Claims 8-10,12-14, 21, 22, 25, 33-35, 37-39, 41, 42, 52, and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagaraj et a1 (US 6,627,323) in view of Spitsberg et a1 (US 6,306,524). Of these claims, 8, 9, 21, 22, 33-35, 41, 42, and 52 remain pending, and each of these claims depend from an independent claim that is not rejected under the applied combination of references. Applicants refer to the above arguments as to why the equation of MCrAlY bond coats, even those comprising Ru, with diffusion barriers is improper, and further submit that each of these pending claims at issue is allowable because each depends from an allowable independent claim.

5. Conclusion

In light of the remarks and amendments presented herein, Applicants believe that this serves as a complete response to the subject Office Action. If, however, any issues remain unresolved, the Examiner is invited to telephone the undersigned at the number provided below.

Respectfully submitted,



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